illustrating a minimum pixel intensity for a pixel location; FIG. **8***c* is a density plot formed by subtracting the maximum values from the minimum values; FIG. **8***d* is a density plot illustrating a defect region;

FIG. **9** illustrates an embodiment that captures data from a transparent medium in accordance with the teachings of the present invention;

FIG. **10** illustrates an embodiment that captures data from a reflective medium using a mirror as a second light source in accordance with the teachings of the present invention;

FIG. **11** illustrates an arrangement of three light sources used with a drum scanner in accordance with the teachings of the present invention; and,

FIG. **12** illustrates another arrangement of four light sources used with a flatbed scanner in accordance with the teachings of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

FIG. **1** illustrates one embodiment of the image defect correction system **10** in accordance with the teachings of the present invention. System **10** includes a scanner **16** that operates to capture data from a document **12**, such as paper, images, negatives, photographs or any other reflective medium. Scanner **16** can be a line scanner, a flatbed scanner or other suitable type of imaging system. An example of such a scanner is the EPSON™ 836 scanner. The data captured from system **10** is generally processed by an external data-processing system **18**. An example of such a data-processing system is a general purpose computer, such as a personal computer, that operates using program instructions to carry out the operations and functions discussed herewithin.

Scanner **16** generally includes a glass or similarly clear platen **22**. Document **12**, the document to be scanned, is placed on top of platen **22**. Document **12** has an image side **12***a,* which will be digitally recorded by scanner **16**. Scanner **16** further comprises an imaging subsystem **24**. In this embodiment, imaging subsystem **24** includes a first light source **26**, a second light source **28**, and a sensing device **30**. Sensing device **30** is operable to capture image data from image side **12***a* produced by light reflected from first light source **26** and light reflected from second light source **28**. In one embodiment, sensing device **30** comprising a detector **32** and an optical system **34**. Optical system **34** is operable to focus the reflected light from document **12** onto detector **32** in such a manner that detector **32** can record the image data from document **12**. In a particular embodiment, detector **32** is a charge coupled device (CCD). However, detector **32** maybe any suitable type of light sensing device. For example, detector **32** may be a CMOS detector, a photoresistor, a phototransistor and the like. As is well known in the art, the detector **32** will, for a color image, have distinct red, green and blue sensor portions. Note that red, green and blue is meant to be any equivalent representation of those colors in any color space such as CMYK, XYZ, LAB, or any other equivalent color space. Color spaces are different ways to represent the red, green and blue colors.

Depending on the type of detector **32** used, scanner **16** may further comprise an analog signal processor **36** and an analog- to-digital converter **38**. Analog signal processor **36** and analog to digital converter **38** are needed if sensing device **30** outputs an analog signal in order to convert the analog signal to a digital signal for processing and storage. Also included with scanner **16** is a power supply **40**, a first electronic switch **42**, and a second electronic switch **44**. First electronic switch **42** is operable to control first light source **26** and second electronic switch **44** is operable to control second light source **28**. Transport mechanism **46** is used to control the movement of imaging subsystem **24**. Controller **48** controls first electronic switch **42**, second electronic switch **44**, and transport mechanism **46**. Controller **48** is, in one embodiment, a programmable micro-controller such as a MC68HCO5 made by Motorola.

In one embodiment, first light source **26** and second light source **28** are implemented as fluorescent light sources. In a particular embodiment first light source **26** and second light source **28** are positioned on opposing sides of a scan line **50**, as illustrated in FIG. **1**. In this embodiment, each light source, first light source **26** and second light source **28**, are illuminated at separate times. In operation, illumination from first light source **26** will illuminate image side **12***a* of document **12** and will also illuminate any defects on image side **12***a* of document **12** and/or platen **22**. The illumination of defects will create effects (such as shadows) towards the right. Similarly, light from second light source **28** will illuminate image side **12***a* of document **12** and cause defects to create effects towards the left. Sensing device **30** will capture the image data created by each of the light sources including image information and defect effect information.

First light source **26** and second light source **28** produce light in accordance with application of power from power supply **40** via first electric switch **42** and second electric switch **44**. Controller **48** connects to first electronic switch **42** via control line C-**2** and second electronic switch **44** connects to controller **48** via control line C-**1**. In this manner, controller **48** can control the operation of first electronic switch **42** and second electronic switch **44**. First electronic switch **42** and second electronic switch **44** can comprise transistors and/or relays or other devices well known in the art to control illumination from a light source. In a typical application, only two states (or levels) of light are needed. For example, when the light sources are fluorescent lamps, the two states are a low intensity level and a high intensity level. This is due to the fact that since fluorescent lamps take a long time to warm up they are usually left in a low intensity level when not in use. Therefore, when a light source is in the off position, in one embodiment, the light source is actually illuminated at a low intensity. The on state represents a higher intensity level than the off state. With light sources other then fluorescent light source, off may actually be a state where there is no illumination. For the purposes of the present invention, the on state represents a higher intensity level than the off state. Other states may be used for calibration purposes or for specialized needs.

In the preferred embodiment first light source **26** is placed at a first angle of 30°–70° from the image plane and second light source **28** is placed at a second angle of 110°–150° from the image plane to produce optimal results. When the angles become too large, i.e., tend towards the perpendicular, specular reflection or glare often diminishes the ability to distinguish the effects of defects. On the other hand, too small an angle often results in a raking-like effect which tends to overemphasize smaller, otherwise insignificant surface protrusions. Therefore, it is preferable to place the light sources at different angles on the axis perpendicular to the document **12** to be scanned.

Data-processing system **18** is preferably an external processing system, such as an external computer running software elements, operable to receive and process captured image data. An example is a personal computer with an Intel Pentium III processor connected to scanner **16** via a universal serial bus. In one embodiment, data-processing system